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Laterality related to the successive selection of Dutch national youth soccer players

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ABSTRACT

In the general population, estimates of left-foot preference are around 20%. In soccer, specific tasks create positional demands, requiring 40% of the players to be left-footed. Whether and how this is related to the selection of players is unknown. To examine the successive selection of soccer players for Dutch national youth teams in relation to foot preference, 280 youth players (age = 16.2 ± 1.08 years) were monitored from the U16 through the U19 teams over the last 5 years. No difference in successive selection between left- and right-footed players was found ($p < 0.05$). Regardless of foot preference, more than 50% of the selected players were deselected out of a national youth team after 2 years. On average, 31% of the national youth players were left-footed, which is higher than expected, based on population estimates ($\chi^2(1) = 37.49$, $p < 0.001$, $w = 0.27$). However, there was an under-representation of left-footed players, based on expected positional demands (i.e., attack, midfield, defence) ($\chi^2(1) = 16.83$, $p < 0.001$, $w = 0.18$). The conclusion is that left-foot preference increases the probability of selection in Dutch national youth soccer teams.

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Laterality; soccer; left-footed; right-footed; talent development

Introduction

In the general population, estimates of left-hand and/or -foot preference are around 20% (Carey et al., 2001; Gabbard & Iteya, 1996). Assuming that talent is equally present in either right- or left-handed and/or -footed players, these estimates should be reflected in sport selection teams as well. However, in several sports (e.g., tennis or handball) (Baker et al., 2013; Hagemann, 2009), significant overrepresentation of left-handed athletes is reported at high levels of performance, with higher numbers than would be expected based on the prevalence of left-handedness in the normal population. Two explanations have been put forward for the overrepresentation of left-handed athletes in elite sports (Grouios, 2004). One explanation is that left-handers have a neuropsychological advantage (Mikheev, Mohr, Afanasiev, Landis, & Thut, 2002). The other explanation assumes that left-handers have a tactical advantage, based on unfamiliarity (Faurie & Raymond, 2005). Since athletes are less used to playing against left-handers, they have more difficulty in anticipating future moves. Up to now, no such observations have been reported in relation to foot preference. Nevertheless, it seems that laterality (i.e., left- or right-handedness or -footedness) could influence the development of sport expertise.

Left-footed soccer players have often been perceived as a valuable commodity throughout soccer history. Recent research has shown that left-foot preference could increase unpredictability and creativity due to inverted brain hemisphere functioning, providing these players with a genetic head start (Brandler et al., 2013). Moreover, it is often assumed that being equally

skilled with both feet (i.e., two-footedness) is an advantage in soccer and a prerequisite for soccer expertise (Grouios, Kollias, Koidou, & Poderi, 2002). Research into the foot preference and skill of players from the 1998 World Cup showed that the players were on average equally skilled with both feet, although they still were biased to using the preferred foot. This was most apparent not only during set pieces but also during dribbles, passes and touches (Carey et al., 2001). In soccer, there are several positions which require specific demands that are suitable for either left-footed or right-footed players (e.g., left backs and right backs). This is reflected, for instance, in the selection criteria applied in the prestigious soccer developmental programme of AFC Ajax, where every team of the Ajax development programme should have at least 4 left-footed field players in their selection, resulting in a percentage of 40% within a 4-3-3 playing formation (e.g., left centre back, left fullback, left midfielder, left winger) (Kleine, 2007, January). This idea has been widely acknowledged within the national Dutch developmental system, which serves as an example for many professional soccer clubs (CIES Football Observatory, 2014).

For a talented youth soccer player, it is important to be selected for a developmental programme of a premier league club in order to increase the chance of becoming a professional soccer player (Vaeyens et al., 2006). The general aim of these developmental programmes is to identify talented young people and successfully develop them into senior professional players (Williams & Reilly, 2000). In addition to these regular developmental programmes, the national football association selects players for international competitions. The best players of the developmental

programmes in premier league clubs are selected for national youth teams, ranging in the Netherlands from the U15s to U21s (KNVB, 2015). The rationale upon which players are successively selected is mainly based on the opinion and experience of soccer scouts, trainers and coaches. In the Netherlands, selection decisions for national youth teams seem based on players' abilities related to the positional demands of soccer. Up to now, however, scientific evidence has been lacking, since this phenomenon has not been systematically investigated. As a consequence, it is unknown whether successive selections of soccer players for Dutch national youth teams differ for left- and right-footed players.

Taken together, the primary goal of this study is to examine the successive selection of players in Dutch national youth teams (i.e., U16s–U19s) over the past 5 seasons (2010–2015) for left- and right-foot preference. It is hypothesised that the distribution of left-footed players will exceed the expected prevalence of left-footedness, based on the general population (left-foot preference around 20%), in the direction of distribution based solely on positional demands (i.e., 40% of the selected field players being left-footed). Any differences between the sample and the general distribution of left- and right-foot preference will be specified across playing positions.

Method

Participants

A total of 280 male soccer players, who were selected for the national youth teams U16s through U19s across the 2010–2015 competitive seasons (101 defenders, 86 midfielders, 93 attackers), were included in the study. One hundred twenty-nine players were selected for only 1 national youth team (i.e., U16 or U17, or U18 or U19), 97 players for 2 national youth teams, 42 players for 3 national youth teams and 12 players were selected for 4 national youth teams. This resulted in 497 season-to-season transitions in teams. About one-third of the players were left-footed. For an overview, see Table 1.

Table 1. Players per Dutch national youth soccer team from the 2010–2011 through the 2014–2015 competitive seasons.

	U-16	U-17	U-18	U-19	Total
Season 2010–2011 (<i>n</i>)	20	23	27	24	94
% Left	35.0	39.1	44.4	33.3	38.3
% Right	65.0	60.9	55.6	66.7	61.7
Season 2011–2012 (<i>n</i>)	21	34	19	30	104
% Left	28.6	29.4	26.3	36.7	30.8
% Right	71.4	70.6	73.7	63.3	69.2
Season 2012–2013 (<i>n</i>)	25	31	33	32	121
% Left	20.0	19.4	27.3	34.4	25.6
% Right	80.0	80.6	72.7	65.6	74.4
Season 2013–2014 (<i>n</i>)	28	28	25	29	110
% Left	50.0	32.1	12.0	27.6	30.9
% Right	50.0	67.9	88.0	72.4	69.1
Season 2014–2015 (<i>n</i>)	14	18	17	19	68
% Left	21.4	44.4	29.4	26.3	30.9
% Right	78.4	55.6	70.6	73.7	69.1
Total (<i>n</i>)	108	134	121	134	497
% Left	32.4	31.3	28.1	31.2	31.0
% Right	67.6	68.7	71.9	67.9	69.0

Procedure

Players admitted and deselected for national youth teams were considered. The annual new admissions and deselections were identified for the U16s (cohort 2010–2011 and 2011–2012), the U17s (cohort 2010–2011, 2011–2012, 2012–2013) and the U18s (cohort 2010–2011, 2011–2012, 2012–2013, 2013–2014). Birth dates, playing position and foot preference were provided by the Royal Netherlands Football Association (KNVB). These data are also available online in the public domain on the football club websites and/or on the players' personal homepage. In addition, foot preference belongs to those overt player characteristics that are directly observable during training and matches a player participates in. As such, ethics approval was not considered necessary and therefore not obtained for this study.

Statistical analysis

All data were analysed using SPSS 22.0. To test whether left-footed players were overrepresented in our sample, an expected laterality distribution of left-foot preference of 20% was applied in this study (Carey et al., 2001; Gabbard & Iteya, 1996). Differences in expected and observed distributions of left- and right-footed players were compared using chi-square tests. Moreover, positional demands in soccer require that foot preference for defenders should be equally distributed, and for midfielders and attackers it is expected that at least one-third of the players should be left-footed in the distribution. This means that an average of 40% of the field players are left-footed. Again, differences in expected and observed distributions of left- and right-footed players were compared using chi-square tests.

To compare successive selection of left- and right-footed national youth team soccer players, a contingency table for players' footedness \times selection step (e.g., U16–U17 s) was computed. In addition to the Pearson chi-square statistic, the effect sizes (*w*) were also calculated as a standardised measurement of the extent of the observed effect (small effect: *w* is around .10; medium effect: *w* is around .30; large effect: *w* is around .50) (Cohen, 1992). Level of significance was set at $p < 0.05$.

Results

Results reveal an overrepresentation of left-footed players in national youth teams, when compared with the prevalence of left-footedness in the general population ($\chi^2 (1) = 37.49$, $p < 0.001$, $w = 0.27$). Right-footed players were selected 343 times, resulting in 69% of the total selections. In 154 of the cases, a left-footed player was selected for a national youth team, resulting in a proportion of 31% of selected left-footed players.

When this distribution of left- and right-footed players across national youth teams is further specified across playing positions in Table 2, the findings indicate that among defenders 41.3% of the players are left-footed, among midfielders 25.7% and among attackers 23.7%. Comparing this with the expected distribution (i.e., 40%) based on positional demands, there is a lower percentage of left-footed players selected ($\chi^2 (1) = 16.83$,

Table 2. Distribution (%) of left- and right-footed players for defenders ($n = 189$), midfielders ($n = 152$) and attackers ($n = 156$).

Playing position	Left footed	Right footed
Defenders	41.3	58.7
Midfielders	25.7	74.3
Attackers	23.7	76.3

$p < 0.001$, $w = 0.18$). The distribution for defenders differs from the expected equality ($\chi^2(1) = 5.76$, $p < 0.05$, $w = 0.17$). Based on positional demands, 50% (i.e., centre back and fullback) of the defenders are expected to be left-footed, but this study found only 41.3% of the selected defenders to be left-footed. For both midfielders and attackers, differences were found in distribution of left-footed players across both positions, between the expected and observed percentages, respectively ($\chi^2(1) = 4.03$, $p < 0.05$, $w = 0.16$; $\chi^2(1) = 6.49$, $p < 0.05$, $w = 0.20$). Fewer left-footed defenders, midfielders and attackers were selected than expected, based on positional demands.

To examine any differences in successive selection between left- and right-footed players, the proportions of players remaining in the national youth teams the following season were calculated, as shown in Table 3. The probability of not being on a national youth team after 2 years is less than 50%, irrespective of foot preference. Table 3 shows 23.1% of the left-footed players, entering at the U16s, reached the U19s. For right-footed players, this was 35.7%. Pearson chi-square test shows no difference in progression between left- and right-footed players for players entering at the U16s ($\chi^2(3) = 0.39$, $p = 0.943$, $w = 0.04$). For the left-footed players who entered at the U17s, eventually 43.8% reached the U19s compared to 46.5% of the right-footed players entering at the U17s (Table 3). No difference was found in probability of successive selection for left- and right-footed players entering at the U17 ($\chi^2(2) = 0.10$, $p = 0.950$, $w = 0.02$). Finally, Table 3 illustrates that, for the players entering at the U18s, no difference for successive selection between left- and right-footed players was found ($\chi^2(1) = 0.02$, $p = 0.964$, $w = 0.02$). Compared to 56.8% of the right-footed players, 55.6% of the left-footed players reached the U18s.

Discussion

In the general population, estimates of left-foot preference are around 20%. All other things being equal, a similar distribution of right- and left-footed players is expected in national youth teams. However, in soccer, specific tasks create positional demands requiring 40% of the players to be left-footed. Whether and how this is related to the selection of left- and right-footed players is unknown. As such, the primary aim of

this study was to examine the successive selection of players in Dutch national youth teams (i.e., U16s–U19s) over the past 5 seasons (2010–2015) for left- and right-foot preference. Results showed that during the 2010–2015 competitive seasons 280 players were selected, resulting in a total of 497 selections across the U16–U19 national youth teams. On average, 69% of players were right-footed compared to 31% for left-footed players, indicating an overrepresentation of left-footed players compared to the general population. It seems therefore that left-footed players have a higher chance of being selected as compared to their right-footed peers. These findings add to the already known variables that affect the chances of development of sport expertise, such as date of birth (Cobley, Baker, Wattie, & McKenna, 2009) and place of birth (Baker & Logan, 2007).

The results indicate that the selection of Dutch national youth soccer players is related to positional demands. Since, in the general population, estimates of left-foot preference are around 20% (Carey et al., 2001), the greater proportion of left-footed players in the sample indicates that coaches may explicitly decide to select a left-footed player over a right-footed player due to positional demands. If it is assumed that there is a relatively equal amount of talented youth soccer players for left- and right-foot preference, the positional demands create more soccer-specific tasks that are suitable for left-foot preference. Hence the left-footed players have a higher chance of selection for Dutch national youth teams than their right-footed peers. Such an explicit selection based on laterality created by positional demands has previously been described in handball (Schorer, Cobley, Büsch, Bräutigam, & Baker, 2009).

Based on the tactical advantages of foot preference across playing positions, the distribution of foot preference is actually lower than would be expected. In soccer, 4 field positions (i.e., 40%), on average, have positional demands, for which left-foot preference can be considered an advantage. Nevertheless, this study found a proportion of only 31% for left-footed players in Dutch national youth teams among all positions. Across every position (i.e., defence, midfield, attack), there was a significant under-representation of left-footedness. Hence, it seems that foot preference is an important consideration but not the sole determinant factor in selection. Therefore, the aforementioned mechanism, in which players are selected based on foot preference, seems to have a limit, where foot preference becomes subordinate to other factors players are selected for. In this light, the role of practise regarding the attainment of expertise might be an explanation. The successive selection of left-footed players could be influenced by the fact that they experience a lack of left-footed models and coaches. This gives left-footed players a lag in strategies for advancement.

Table 3. Proportions (%) of national youth team players that remained selected in successive seasons across age categories.

	Right footed								Left footed							
	U16		U17		U18		U19		U16		U17		U18		U19	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
U16	28	100.0	20	71.4	15	53.6	10	35.7	13	100.0	9	69.2	6	46.2	3	23.1
U17			43	100.0	29	67.4	20	46.5			16	100.0	12	75.0	7	43.8
U18					37	100.0	21	56.8					18	100.0	10	55.6

Note: The row-wise percentages reflect the players who have played in the respective age category indicated in the precolumn.

Another explanation could be that positional demands therefore can also change due, for instance, to a change in playing formation or other tactical considerations. This becomes especially apparent among attackers, who showed the greatest deviation from the expected distribution, based on positional demands. It seems that coaches are more concerned about the defensive positional demands, with most of the left-footed players in this position. In contrast, attackers are required to create open space and have more unpredictable movement patterns, which could mean that their position is less rigid and therefore less demanding for a certain foot preference (Duarte et al., 2012). These players have well-developed tactical skills which are, for instance, reflected in the tactical ingenuity of wingers who switch positions to surprise their direct opponents (Kannekens, Elferink-Gemser, & Visscher, 2011).

Regarding successive selection, most players, either left- or right-footed, do not reach the U19 team but instead are deselected after 1 or several seasons. Players who were selected at a later stage eventually replace the players selected at a younger age. These high turnover rates are in line with a study of Portuguese national youth soccer players, which reports that 99% of the 170 players selected for a national youth team at the age of 17 did not reach the senior national team (Barreiros, Côté, & Fonseca, 2014). Moreover, in Germany, only 31% of the senior national soccer team players had been selected for a national youth team at an earlier age (Güllich, 2014). Since there were no differences in proportions of left- and right-footed players remaining in the Dutch national youth teams, it seems that the distribution of left-footed players in our sample remains approximately equal across teams. Hence, the increased probability of selection for left-footed players seems to be apparent across each national youth team. To be selected for a national youth team, a player has to be enrolled in the developmental programme of a premier league club. Therefore, national youth teams are a so-called “selection in selection” (Jiménez & Pain, 2008, p. 999). The proportion of left-footed players within the national youth teams may be reflected in the developmental programs of premier league clubs; however, more research is warranted.

Although this study gained insight into the selection decisions of Dutch national youth soccer players, these results would seem to apply to soccer in general. Selection decisions are often a balance of personal (i.e., footedness) and task-specific factors (i.e., positional demands) in sports, which make these decisions extremely complex. The low percentage of players remaining in the national youth teams was also found in other countries, contributing to the difficulty of assessing players’ long-term performance potential (Vaeyens, Lenoir, Williams, & Philippaerts, 2008). It is recommended that future research should include the elite senior national teams in order to examine the success level eventually attained at senior age of left- and right-footed players, since it is still possible to be selected for senior national teams at a later stage in a player’s career. Moreover, the development of expertise in left-footed players should be studied individually, especially left-footed attackers. This will generate insight and understanding as to whether left-footed players are more likely to attain the very top level in soccer. To illustrate this, both the winner of the Golden Ball of the 2014 World Cup in

Brazil, Lionel Messi, as well as second runner-up, Arjen Robben, are left-footed players. Moreover, the winner of the Golden Boot (i.e., top goal scorer of the tournament), James Rodriguez, is left-footed. These left-footed players also were each given a “man of the match” award during at least 3 matches in the recent 2014 World Cup (Fédération Internationale de Football Association (FIFA), 2014).

Conclusion

Left-foot preference increases the probability of selection in Dutch national youth soccer teams. This study found that an overrepresentation of left-footed players, compared to general population estimates, was apparent. Positional demands are related to the selection of national youth team soccer players but not as strongly as expected. There was no difference in successive selection between left- and right-footed players, with more than 50% of the selected players being deselected out of a national youth team after 2 years. As such, this study adds to the current knowledge about those factors that are related to the development of expertise in soccer.

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Disclosure statement

No potential conflict of interest was reported by the authors.

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